

# Git and GitHub

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# Today's goals

- By the end of today, you should be able to...
  - describe what version control systems are and their purposes
  - push and pull remote repositories from local computers
  - version control local files using git clients

# A Quick Notice

- This is a discussion session - we are here to help guide you through the course materials
- Please feel free to interrupt us with questions or comments!

# Agenda

- VCS (Version Control Systems)
- What is Git and GitHub
- Features
- Git Client
- Basic use
- Branches and GitFlow (if time permits)

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# Why Version Control?



Source:

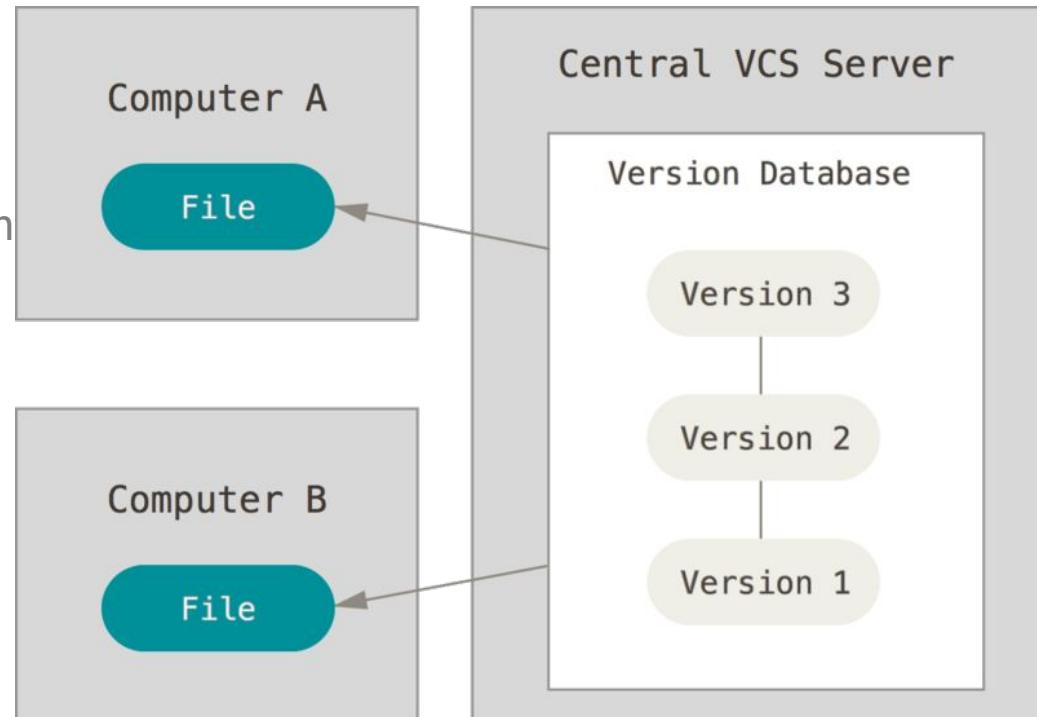
<https://twitter.com/aksharpathak>

# VCS (Version Control Systems)

- Enable collaboration between many developers
- Recover files or revert to previous state
- Identify who made modifications/issues
- Two main types
  - Centralized VCS
  - Decentralized VCS

# VCS (Version Control Systems)

- Centralized VCS
  - Central Repository
  - Limited and high cost branch
  - Ex: SVN

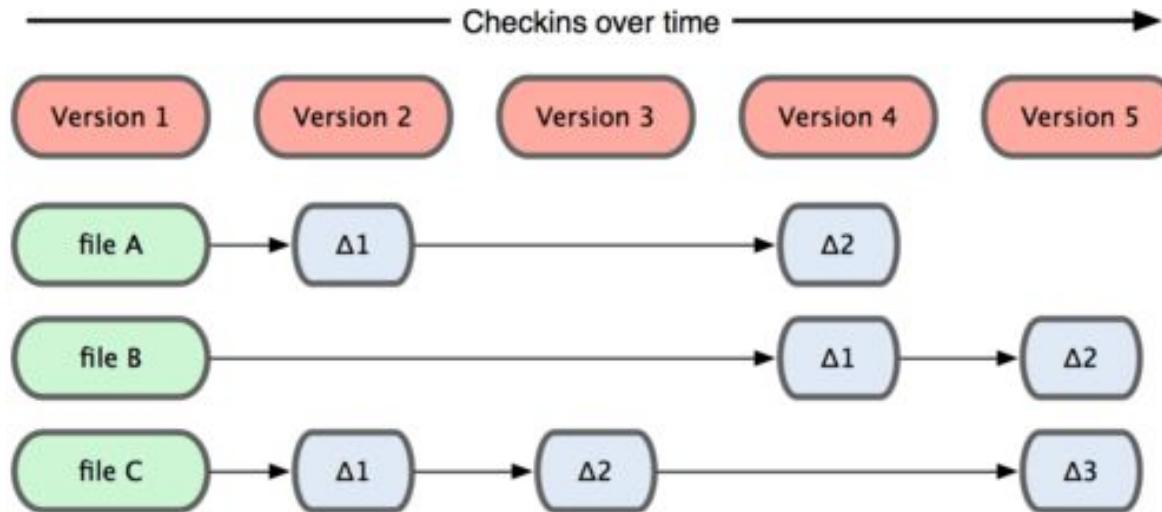


Source:

<https://git-scm.com/book/en/v2/Getting-Started-About-Version-Control>

# VCS (Version Control Systems)

- Centralized VCS
  - SVN: Stores list of changes to files

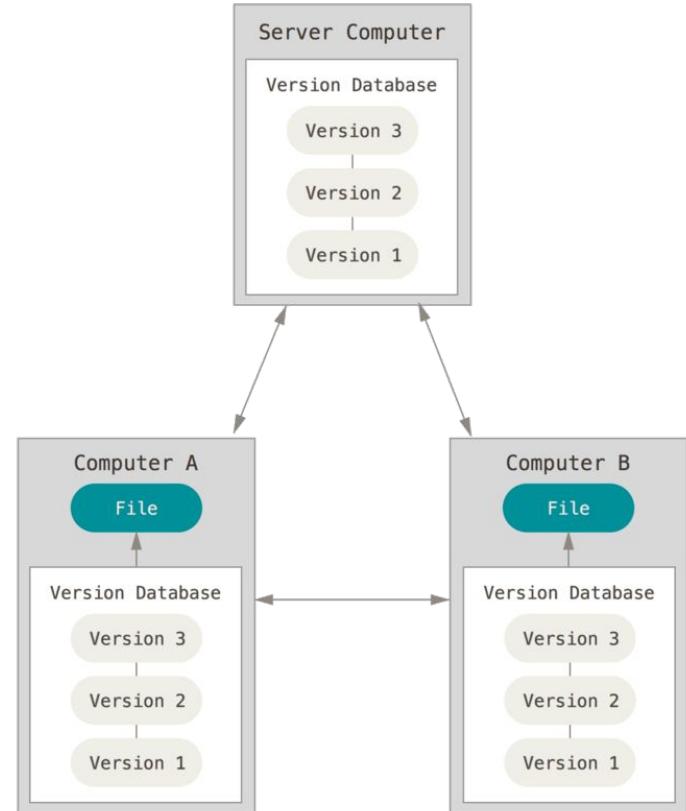


Source:

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# VCS (Version Control Systems)

- Decentralized VCS
  - Each collaborator has a copy
  - E.g.: Git



Source:

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# Git and GitHub

Git:

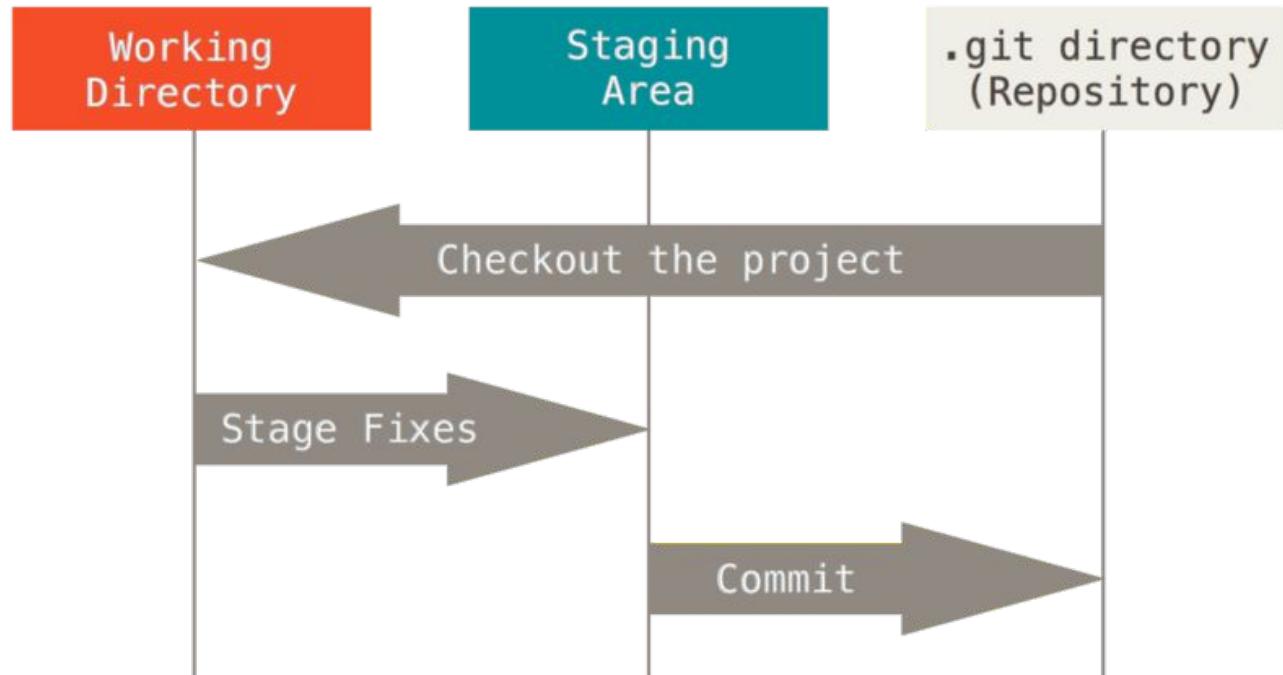
- Free and open source system
- Focused on integrity, speed and high collaboration
- Nearly every operation is local
- Decentralized VCS



# Git and GitHub

Git local file states:

- Modified
- Staged
- Committed

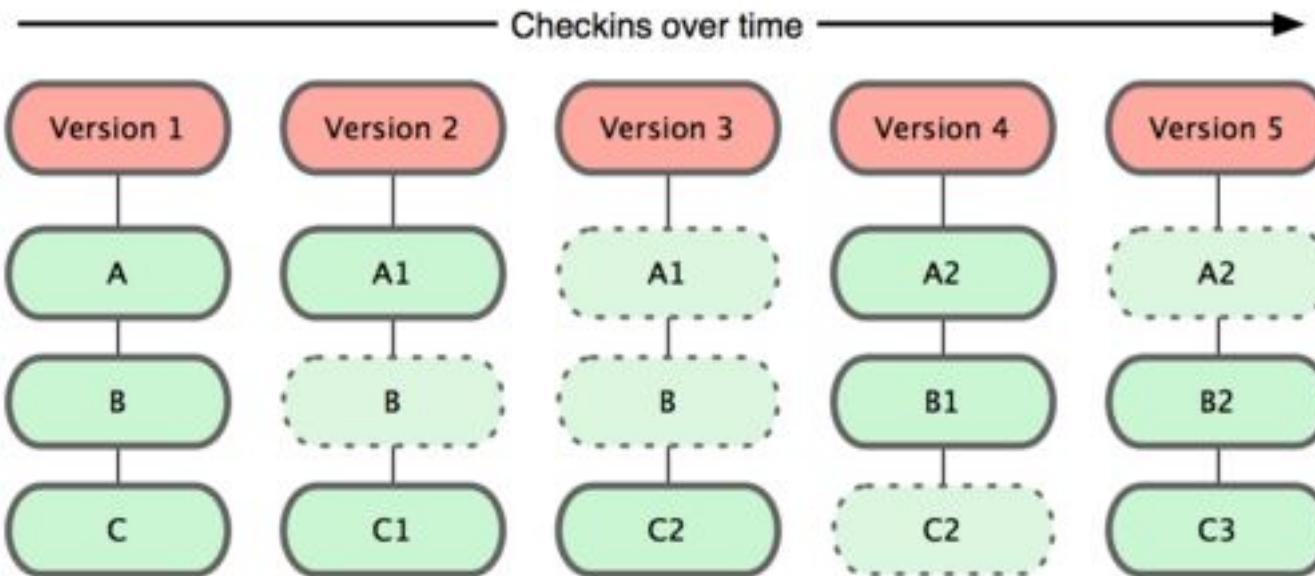


Source:

<https://git-scm.com/book/en/v2/Getting-Started-What-is-Git%3F>

# Git and GitHub

Git stores data as snapshots



Source:

<https://git-scm.com/book/en/v1/Getting-Started-About-Version-Control>

# Git and GitHub

GitHub: service for hosting Git repository.

- Git is the tool, GitHub is the service to host projects that use Git.
- Other options: Bitbucket, GitLab, and many others.
- Mostly free with other premium plans
- Large community collaboration on open source projects
  - (Good for your CV/Portfolio)

# Features

- Reliable storage of your data
- Public or private repositories (based on your plans)
- Collaboration between different people
- Version control
- Repository search (programing language, framework, etc)
- Repository ranking (stars)
- Addons/Plugins

# Agenda

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- Basic use
- Branches and GitFlow (if time permits)

# Git Clients

- There are many GUI tools
  - SourceTree
  - GitKraken
  - Github Desktop
- For this discussion, we will cover Github Desktop and Command Line Interface
  - Installation
  - Basic Usage
- I (and some other TAs) personally use CLI much more :)

An example or Assignment 1

# Using Git Command Line

# Installing Git Command Line

- Install using your favorite package manager
  - <https://git-scm.com/download/linux>
  - For example:

```
# apt-get install git          // Debian-based
# yum install git             // Fedora (up to 21)
# pacman -S git               // Arch
```

- I personally like
  - HomeBrew: <https://brew.sh/>
- An official guide:  
<https://git-scm.com/book/en/v2/Getting-Started-Installing-Git>

# Configuring Git

- Configure git with your email and name
  - These are NOT credentials for your server
  - Local records that show who made which commit

```
$ git config --global user.name "Peter the Anteater"  
$ git config --global user.email "peteranteater@uci.edu"
```

# Using Git Command Line

- Initializing a new local repository
  - Navigate to a directory you want to start version controlling and initialize

```
you@local:~$ cd /your/local/project  
you@local:/your/local/project$ git init
```

- Commit changes (local)
  - Modified files need to be staged (tracked) for commit by using git add

```
you@local:/your/local/project$ touch new_file.txt  
you@local:/your/local/project$ git add new_file.txt  
you@local:/your/local/project$ git commit -m "Added new_file.txt"
```

# Using Git Command Line

- Push
  - Set the remote url to your newly-created github repository

```
you@local:/project$ git remote add origin https://github.com/your-repo.git
```

- Push to your github repository

```
you@local:/project$ git push origin master
```

- You need to push in order to save the changes in your hosted repository (e.g., github)

# Using Git Command Line

- Fetch, Merge
  - Fetch - a “safe” way to download changes to your local repository
    - Does not merge changes with local

```
you@local:/project$ git fetch origin
```

- Merge - applies the remote’s changes with local

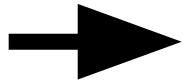
```
you@local:/project$ git merge origin
```

- Pull
  - Identical to fetch + merge

```
you@local:/project$ git pull origin
```

# Using Git Command Line

- Conflict when pulling
  - Merge conflict error



```
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 1), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), done.
From https://github.com/jongh19/example
 * branch            master      -> FETCH_HEAD
   739a077..c46bbee  master      -> origin/master
Auto-merging my-file.txt
CONFLICT (content): Merge conflict in my-file.txt
Automatic merge failed; fix conflicts and then commit the result.
```

- Resolve conflict, add and commit file

```
1 This is a line Bob wrote in his local computer.
2 This is a second line Bob wrote in his local computer.
3 This is a line Bob wrote in his local computer.
```

Original



Conflict



```
1 This is a line Bob wrote in his local computer.
2 This is a second line Bob wrote in his local computer.
3 <<<<< HEAD
4 This is a line Bob wrote in his local computer.
5 =====
6 This is a line Bob wrote in his remote.
7 >>>> c46bbee024fe3da6f9608df1020413bfafe054ce
```

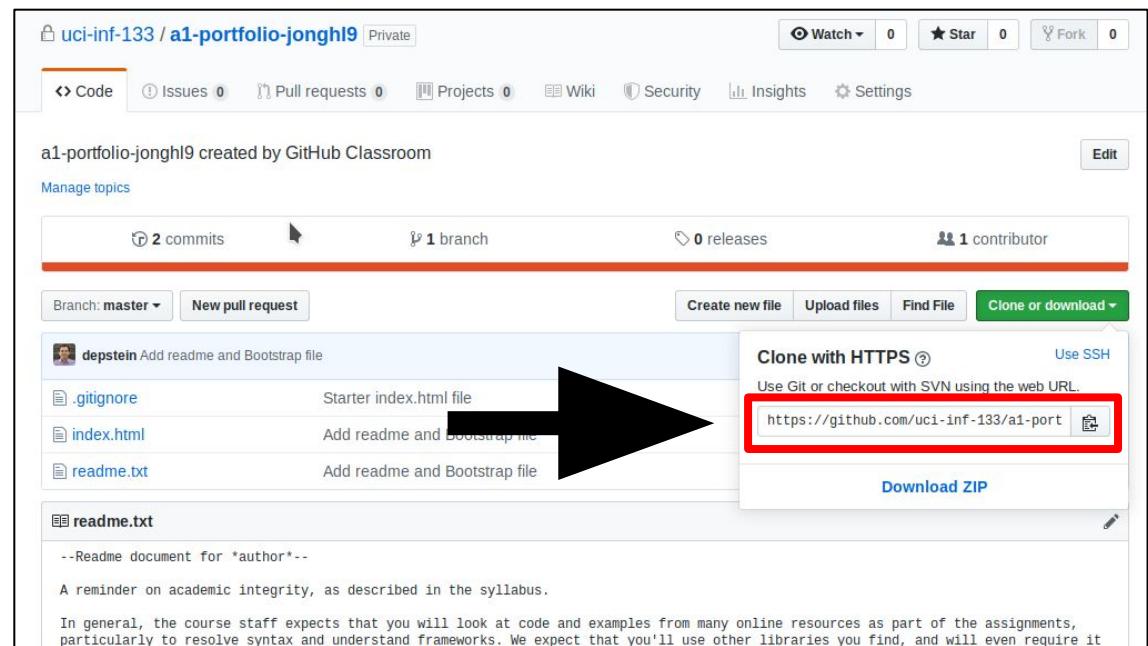
Resolved



```
1 This is a line Bob wrote in his local computer.
2 This is a second line Bob wrote in his local computer.
3 This is a line Bob wrote to resolve the conflict.
```

# Using Git Command Line

- Downloading an existing repository from Github



# Using Git Command Line

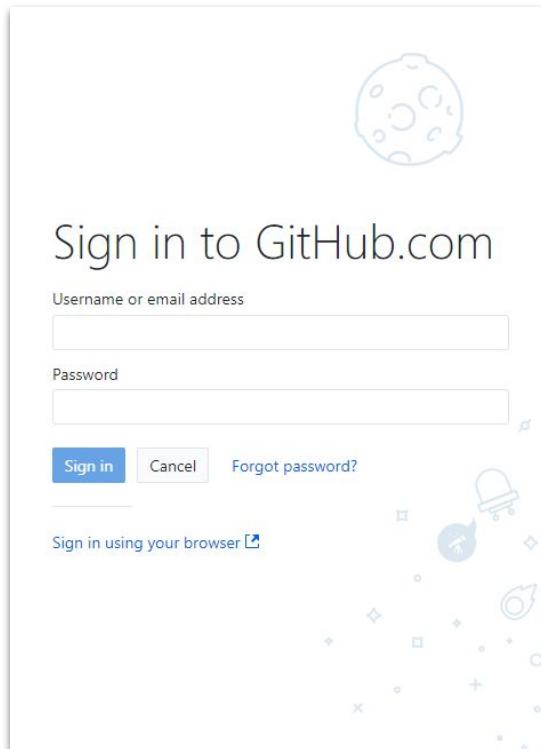
- Downloading an existing repository from Github

```
you@local:~$ git clone https://github.com/your/github/repo.git
```

# Using GitHub Desktop

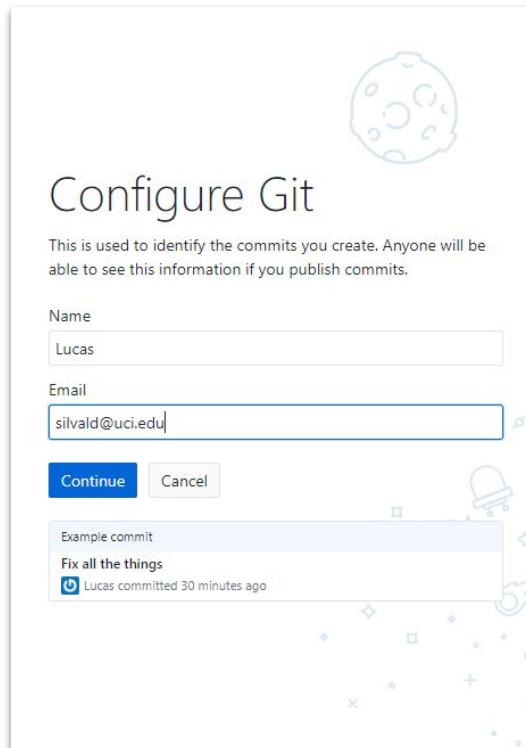
# Installing Desktop Client

1. Sign up on [github.com](https://github.com)
2. Download client at  
<https://desktop.github.com>  
(Mac OS and Windows)



# Installing Desktop Client

## Configure Git



# Agenda

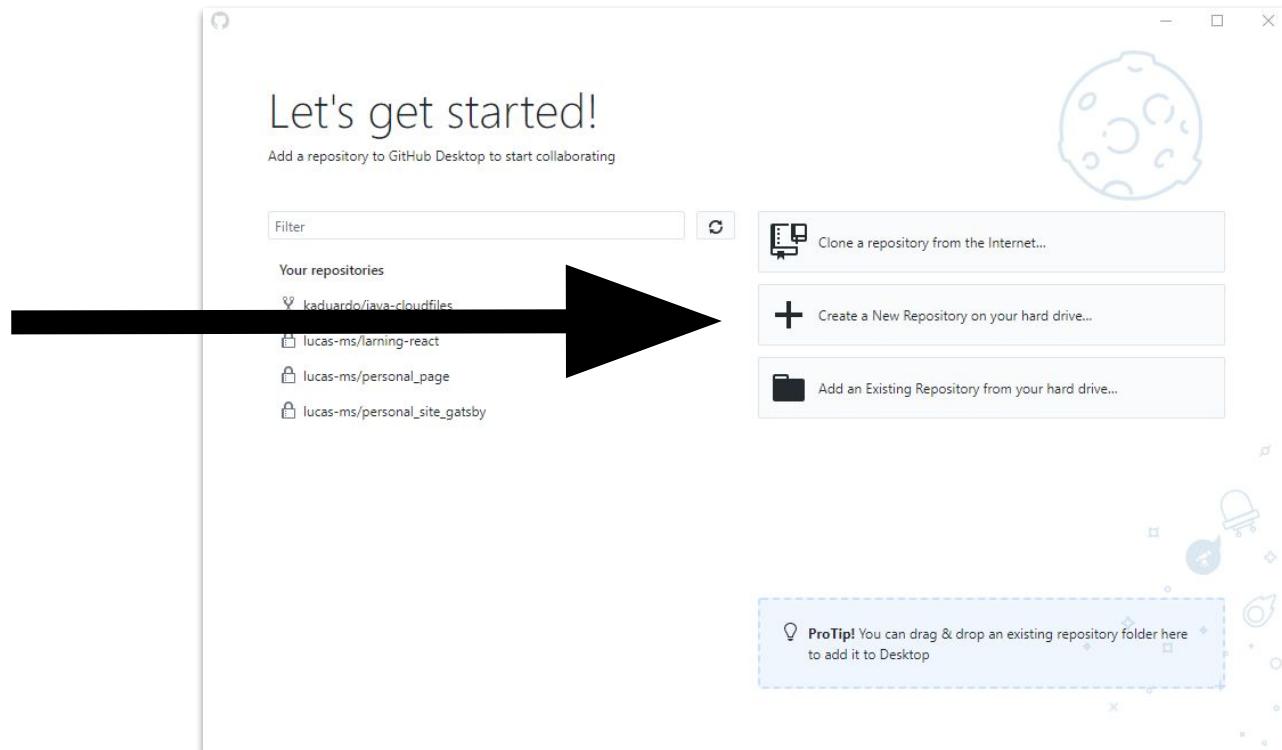
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# Basic Use

- New repository
- Commit
- Push/Publish
- Fetch, merge / pull
- Clone repository

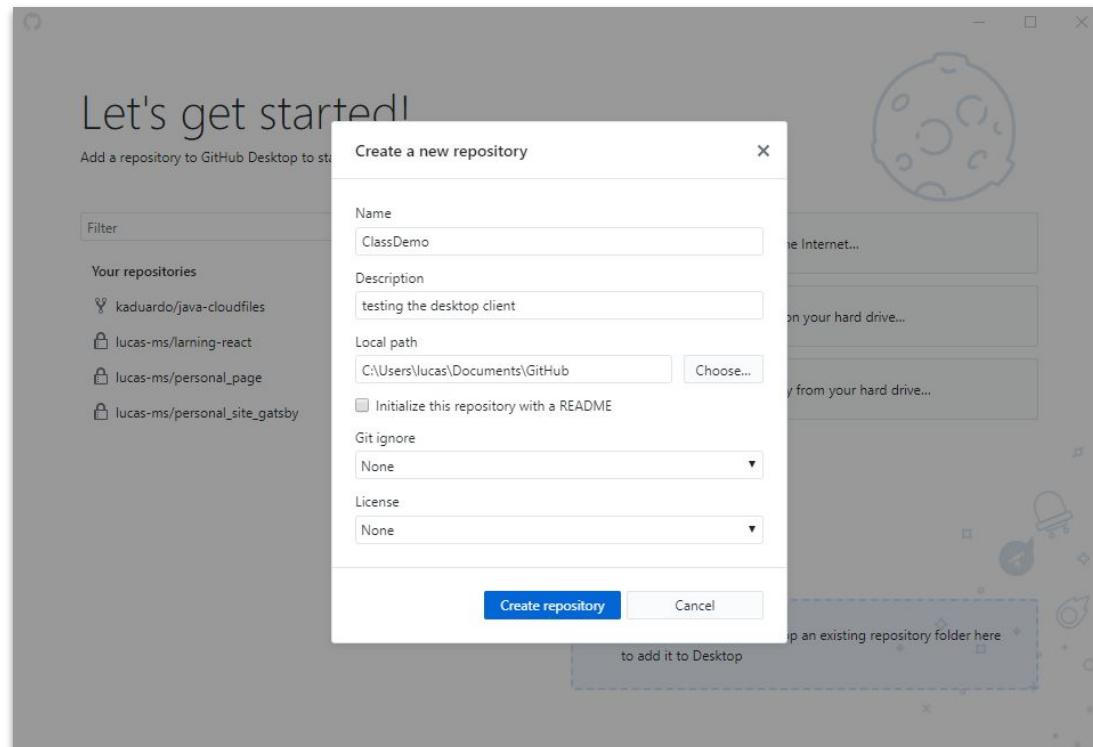
# Using Desktop Client

## New Repository



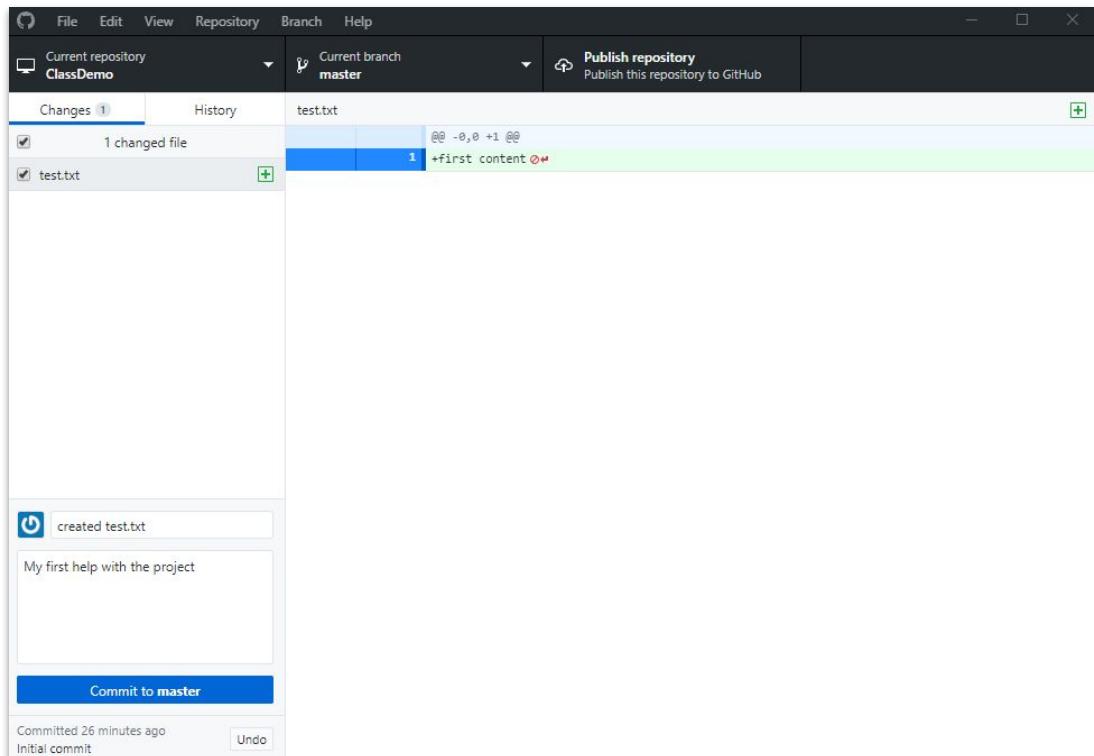
# Using Desktop Client

## New Repository



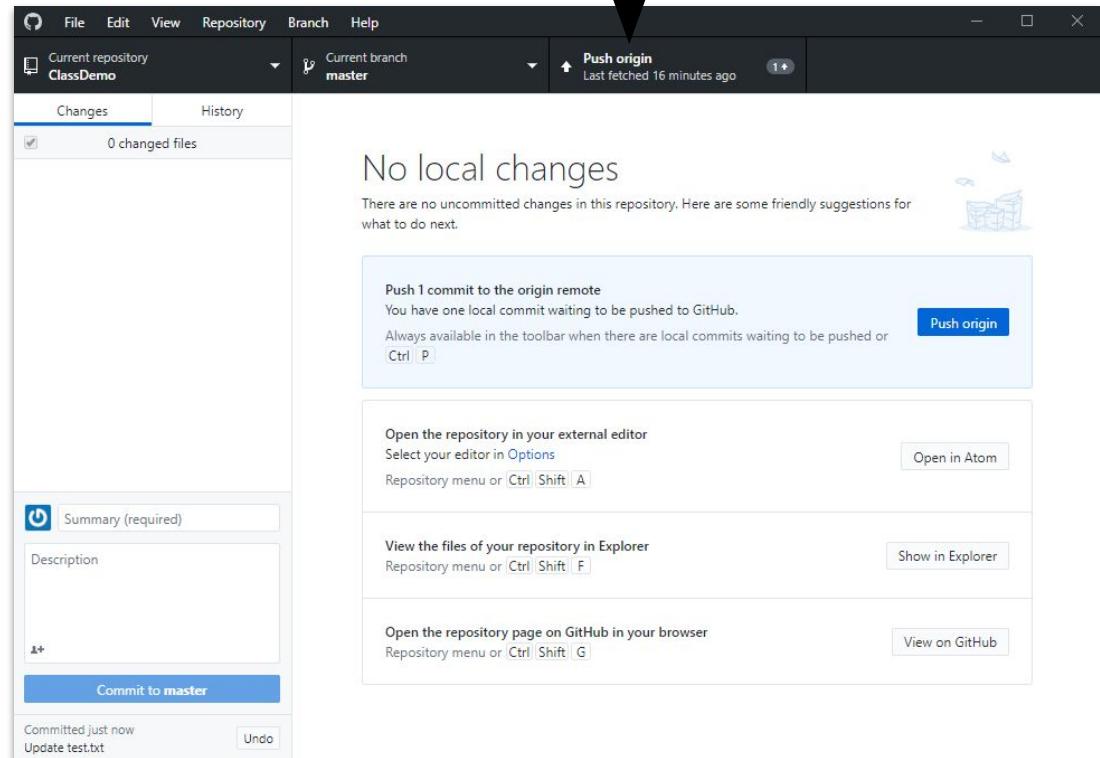
# Using Desktop Client

- First commit
  - Still only local!
- Make as many commits as necessary



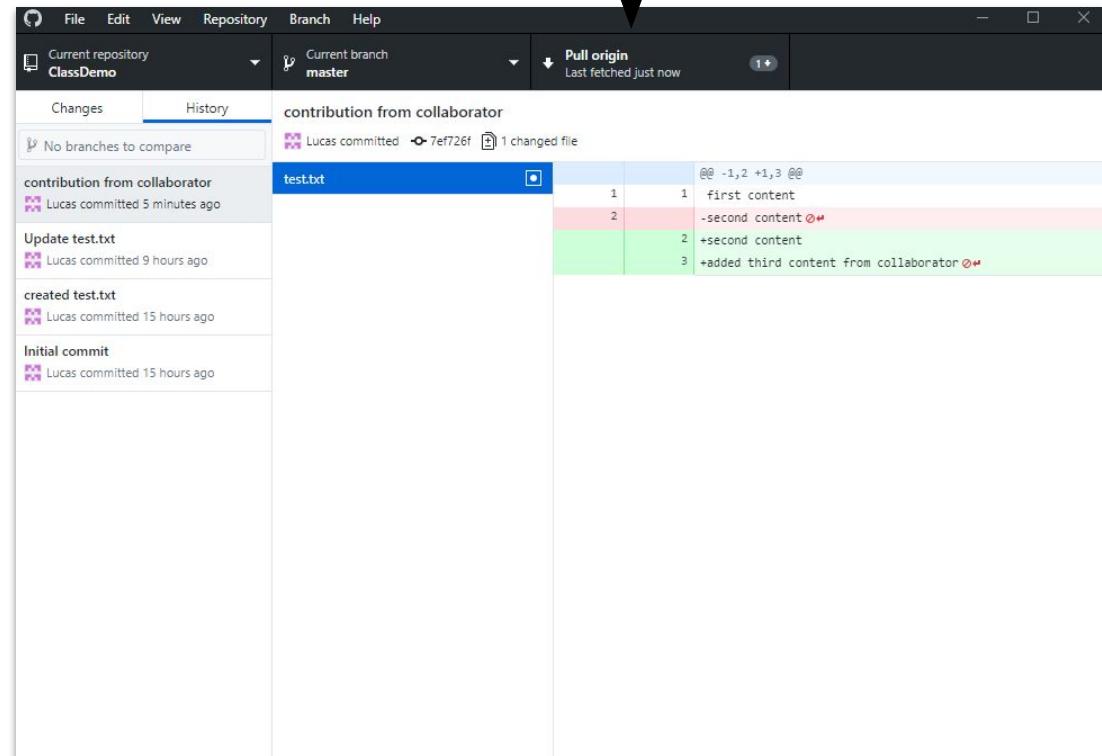
# Using Desktop Client

- Push
  - Now sends all local commits to server



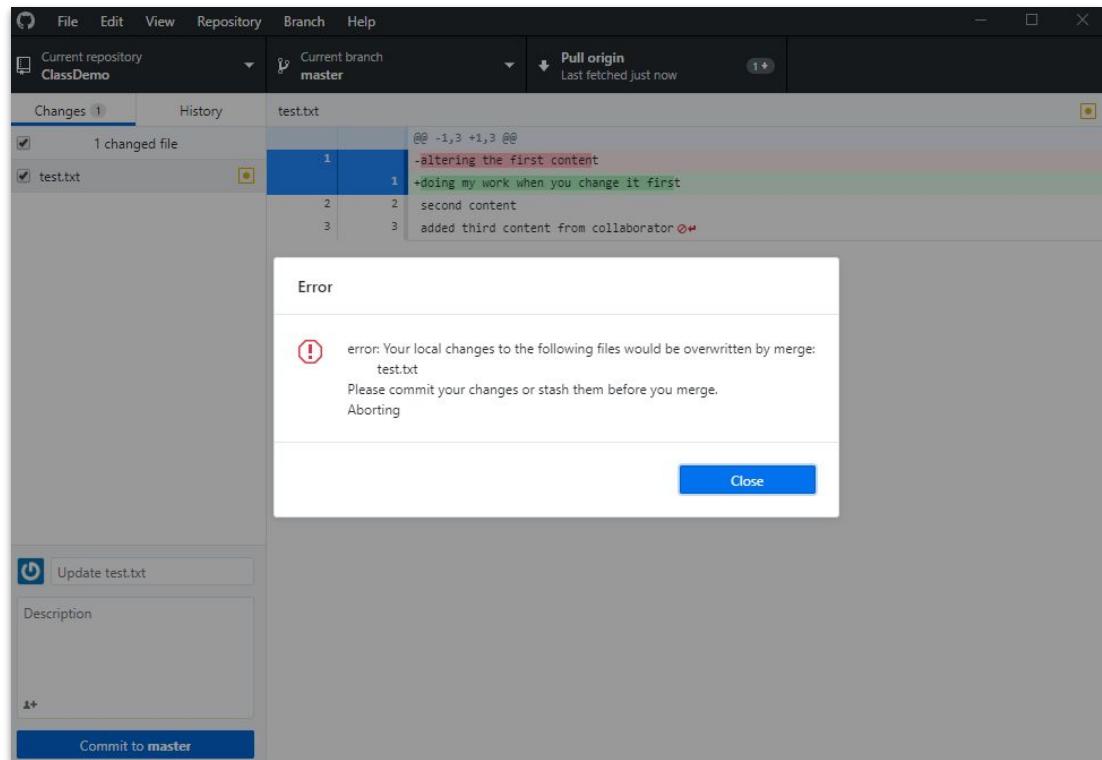
# Using Desktop Client

- Fetch
  - Downloads data from server
- Pull
  - Downloads + Merges



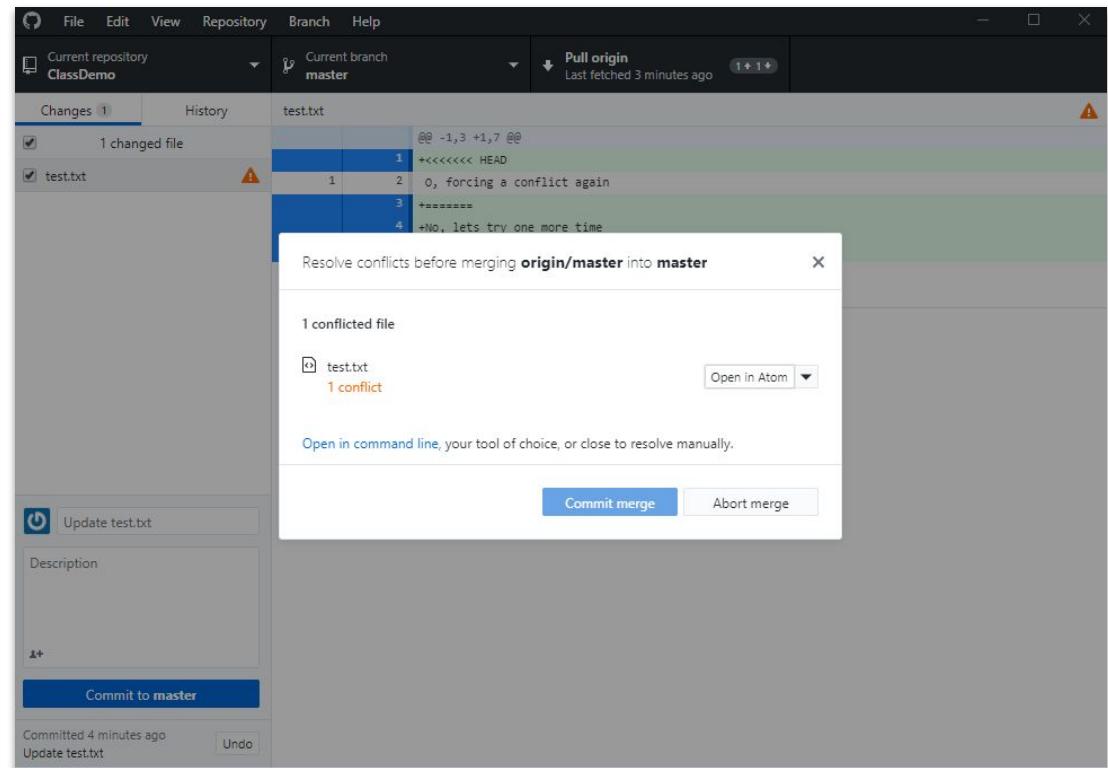
# Using Desktop Client

- Conflict when pulling  
(merging)



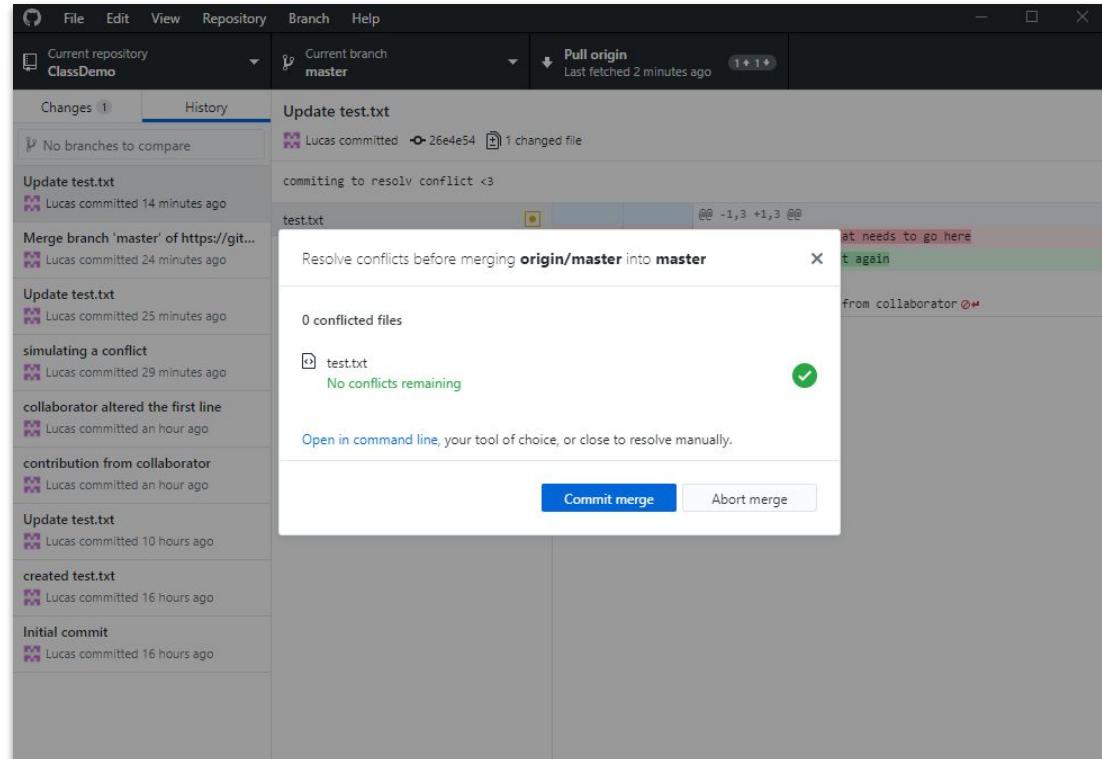
# Using Desktop Client

- Conflict when pulling (merging)
  - Commit your changes to local repository



# Using Desktop Client

- Conflict when pulling (merging)
  - Commit your changes to local repository
  - Resolve conflict
  - Commit merge
  - Push



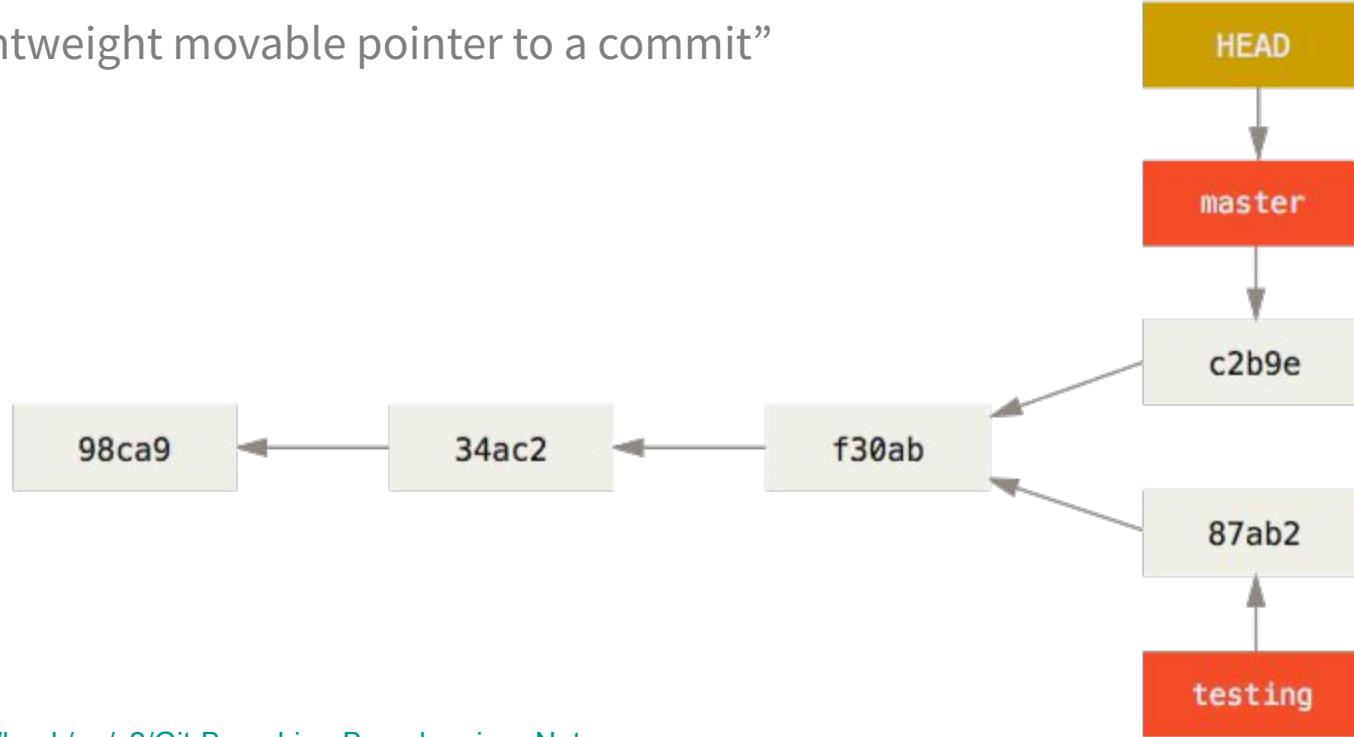
# **Lets try it out now!**

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# Branches

- “A lightweight movable pointer to a commit”

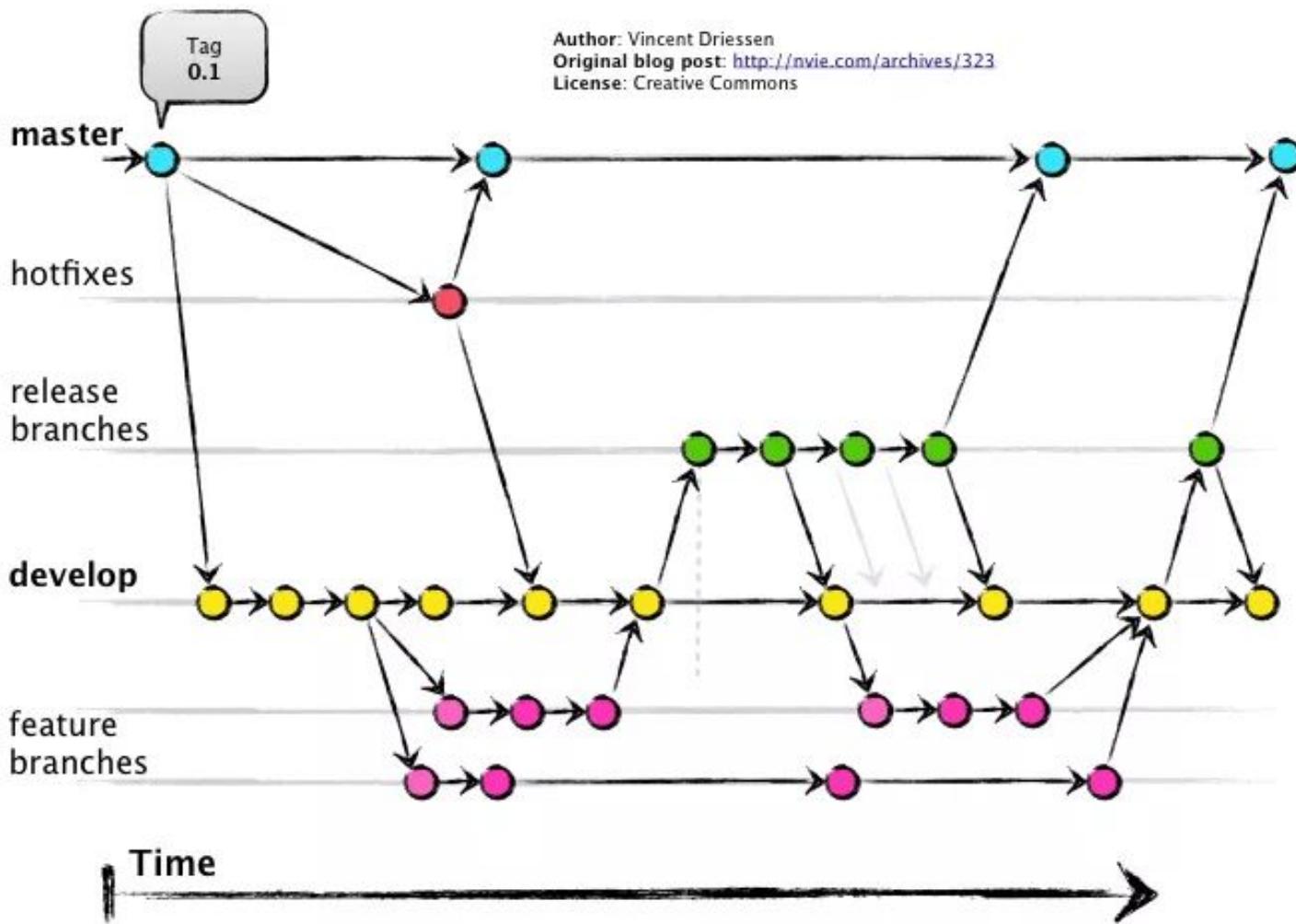


Source:

<https://git-scm.com/book/en/v2/Git-Branching-Branches-in-a-Nutshell>

# GitFlow

- A workflow methodology
  - Organizes bug fixes, releases, features, etc
  - Directs collaboration in large projects



# Further Resources

- Atlassian git tutorial
  - <https://www.atlassian.com/git/tutorials>
- Git documentation
  - <https://git-scm.com/docs>
- GitFlow
  - [GitFlow https://nvie.com/posts/a-successful-git-branching-model/](https://nvie.com/posts/a-successful-git-branching-model/)
- GitHub Flow
  - <https://guides.github.com/introduction/flow/>
- My TA Office hours: See course website
- Credits to previous TAs Lucas and Jong for the slides